



#6

1/21

SEQUENCE LISTING

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VAN THIELEN, NOCHA
CHEN, ROUYING
ISHITANI, MANABU

<120> SIGNAL TRANSDUCTION STRESS-RELATED PROTEINS AND METHODS
OF USE IN PLANTS

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<140> 09/828,447

<141> 2001-04-06

<150> 60/196,001

<151> 2000-04-07

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<170> PatentIn Ver. 2.1

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0922447-0922504

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<212> DNA

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<212> DNA

<213> *Physcomitrella patens*

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<212> DNA

<213> *Physcomitrella patens*

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<213> Physcomitrella patens
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65 70 75 80

Asn Gly Val Leu Glu Ser Thr Val His Gln Asp Met Thr Gln Pro Leu
100 105 110

Gln Leu Ser Ser Asp Ser Ser Asp Val Pro Ile Ala Ala Ala Leu Gln
130 135 140

Arg Gly Val Arg Val Val Glu Leu Asp Leu Trp Pro Asp Asp Lys Gly
145 150 155 160

Gly Ile Lys Val Thr His Gly Asn Thr Leu Thr Ser Pro Val Ala Phe
165 170 175

Glu Lys Cys Ile Lys Ala Ile Lys Ala Asn Ala Phe Val Ser Ser Lys
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Tyr Pro Val Val Ile Thr Leu Glu Asp His Leu Ser Ser Pro Leu Gln
195 200 205

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210 215 220

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Val	Ser	Ser	Lys	Tyr	Pro	Val	Val	Ile	Thr	Leu	Glu	Asp	His	Leu	Ser
610			615			620									
Ser	Pro	Leu	Gln	Ala	Leu	Ala	Ala	Glu	Thr	Leu	Thr	Asn	Ile	Leu	Gly
625			630			635						640			
Glu	Asp	Leu	Tyr	Tyr	Pro	Pro	Ser	Ser	Asp	Gly	Phe	Lys	Glu	Leu	Pro
			645			650						655			
Ser	Pro	Glu	Ser	Leu	Lys	Gly	Lys	Ile	Leu	Ile	Ser	Thr	Lys	Pro	Pro
			660			665						670			
Lys	Glu	Tyr	Leu	Glu	Ala	Ala	Val	Ala	Gln	Lys	Ser	Ala	Leu	Lys	Asp
675			680			685									
Glu	Lys	Ile	Leu	Asn	Glu	Phe	Lys	Lys	Ala	Asp	Lys	Leu	Gln	Glu	Gln
690			695			700									
Ser	Thr	Ala	Pro	Val	Lys	Ser	Pro	Val	Glu	Lys	Lys	Ile	Ala	Val	Pro
705			710			715						720			
Pro	Ser	Glu	Lys	Thr	Lys	Ser	Ile	Ser	Glu	Glu	Lys	Asp	Leu	Ser	Glu
			725			730						735			
Lys	Val	Gly	Asn	Leu	Arg	Val	Asp	Ser	Glu	Gly	Glu	Ser	Ala	Asp	Pro
			740			745						750			
Ala	Pro	Ala	Ser	Ser	Pro	Asp	Gly	Lys	Lys	Ala	Thr	Leu	Thr	Ala	Asp
755			760			765									
Ser	Glu	Ser	Asp	Asp	Asp	Asp	Asn	Lys	Lys	Asn	Pro	Glu	Tyr	Ala	Arg
770			775			780									
Leu	Ile	Thr	Ile	His	Gln	Ser	Lys	Pro	Ser	Lys	Gly	Thr	Thr	Val	Glu
785			790			795						800			
Asp	Arg	Leu	Lys	Val	Glu	Gly	Thr	Val	Val	Arg	Ile	Ser	Leu	Ser	Glu
			805			810						815			
Thr	Lys	Leu	Glu	Lys	Val	Thr	Glu	Glu	Phe	Pro	Glu	Leu	Val	Val	Lys
			820			825						830			

10/21

Phe Thr Gln Arg Asn Ile Leu Arg Val Tyr Pro Ala Gly Asn Arg Val
835 840 845

Asn Ser Ser Asn Tyr Asp Pro Thr Ala Ala Trp Ile His Gly Ala Gln
850 855 860

Met Val Ala Gln Asn Met Gln Gly Tyr Gly Lys Glu Leu Trp Gln Ala
865 870 875 880

His Gly Lys Phe Arg Gly Asn Gly Gly Cys Gly Tyr Ile Leu Lys Pro
885 890 895

Lys Tyr Leu Leu Glu Asp Leu Pro Asn Gly Lys Pro Phe Asn Pro Ser
900 905 910

Ala Pro Gly Asp Thr Lys Met Ile Leu Lys Val Lys Val Met Thr Thr
915 920 925

Met Gly Trp Asp Lys Ala Phe Pro Lys Tyr His Phe Asp Leu Phe Ser
930 935 940

Pro Pro Asp Phe Phe Thr Arg Leu Leu Val Thr Gly Val Pro Ala Asp
945 950 955 960

Val Ala Lys Trp Lys Thr Ser Val Ile Asp Asp Val Trp Glu Pro His
965 970 975

Trp Asn Glu Asp His Glu Phe Tyr Leu Lys Cys Pro Glu Leu Ala Leu
980 985 990

Leu Arg Ile Glu Val Arg Asp His Asp Glu Glu Ser Gln Asp Glu Phe
995 1000 1005

Glu Gly Gln Ala Cys Leu Pro Met His Glu Ile Lys Asp Gly Tyr Arg
1010 1015 1020

Cys Val Gln Met Tyr Asp Lys Lys Gly Ser Val Leu Lys Gly Val Lys
1025 1030 1035 1040

Met Leu Phe His Phe Gln Lys Arg Ser Phe Ser Pro Val Gln
1045 1050

<210> 12

<211> 628

<212> PRT

<213> Physcomitrella patens

<400> 12

Met Cys Ser Ile Ala Cys Cys Arg Ser Gly Thr Pro Lys Gly Asp Pro
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Glu Gln Asp Leu Val Gly Glu Val Phe Thr Ile Tyr Ser Glu Asn Glu
20 25 30

Arg Met Ser Ala Glu Gly Leu Leu Lys Phe Leu His Thr Glu Gln Gly
35 40 45

Trp Thr Phe

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Asp	Val	Asp	Phe	Thr	Leu	Asp	Asp	Ala	Lys	Gln	Ile	Met	Glu	Arg	Ile	50	55	60
Arg	Lys	Asp	Trp	Lys	Lys	Ser	Phe	Gly	Leu	Ala	Ser	Ile	Asn	Ser	Asp	65	70	75
Leu	Ser	Lys	Glu	Ala	Phe	Arg	Lys	Tyr	Leu	Met	Asn	Pro	Asp	Leu	Asn	85	90	95
Gly	Val	Leu	His	Asn	Val	Val	His	Gln	Asp	Met	Thr	Gln	Pro	Met	Ser	100	105	110
His	Tyr	Phe	Ile	Phe	Thr	Gly	His	Asn	Ser	Tyr	Leu	Thr	Gly	Asn	Gln	115	120	125
Leu	Ser	Ser	Asp	Ser	Ser	Asp	Thr	Pro	Ile	Ala	Ala	Ala	Leu	Arg	Arg	130	135	140
Gly	Val	Arg	Val	Val	Glu	Leu	Asp	Leu	Trp	Pro	Asp	Asp	Lys	Gly	Gly	145	150	155
Met	Lys	Val	Thr	His	Gly	Asn	Thr	Leu	Thr	Asn	Pro	Val	Ser	Phe	Gln	165	170	175
Lys	Cys	Val	Thr	Ala	Ile	Lys	Asn	Asn	Ala	Phe	Phe	Thr	Ser	Glu	Tyr	180	185	190
Pro	Val	Cys	Val	Thr	Ile	Glu	Asp	His	Leu	Thr	Ser	Glu	Leu	Gln	Gly	195	200	205
His	Ala	Ala	Glu	Ile	Leu	Glu	Gln	Ile	Leu	Gly	Asp	Ala	Leu	Tyr	Tyr	210	215	220
Pro	Pro	Thr	Thr	Asp	Ala	Leu	Val	Glu	Phe	Pro	Ser	Pro	Glu	Ser	Leu	225	230	235
Lys	Arg	Lys	Ile	Ile	Ile	Ser	Thr	Lys	Pro	Pro	Lys	Glu	Tyr	Leu	Glu	245	250	255
Ala	Cys	Ser	Thr	Gln	Lys	Leu	Ala	Met	Glu	Asn	Arg	Asn	Leu	Val	Glu	260	265	270
Glu	Leu	Glu	Lys	Glu	Asp	Lys	Leu	Glu	Gln	Thr	Thr	Phe	Ala	Pro	Leu	275	280	285
Glu	Glu	Asn	His	Ile	Leu	Gly	Glu	Asn	Thr	Pro	Ser	Leu	Arg	Lys	Glu	290	295	300
Val	Glu	Val	Leu	Ser	Gln	Lys	Glu	Met	Ser	Thr	Pro	Ala	Glu	Leu	Asn	305	310	315
Ser	Arg	Ser	Pro	Ser	Asp	Leu	Gly	Glu	Ala	Thr	Ser	Thr	Arg	Tyr	Ser	325	330	335
Lys	Ser	Asn	Asp	Gly	Asn	Asp	Asn	Pro	Lys	His	Phe	Lys	Tyr	Ala	Arg	340	345	350

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12/21

Leu Ile Thr Ile Arg Leu Ala Lys His Ala Lys Gly Thr Ser Met Glu
 355 360 365

His Arg Leu Gln Val Asp Glu Ser Val Lys Arg Ile Ser Leu Ser Glu
 370 375 380

Ser Lys Leu Glu Lys Val Val Glu Lys Trp Pro Glu Ala Leu Val Lys
 385 390 395 400

Phe Thr Gln Lys Asn Ile Leu Arg Val Tyr Pro Ala Ala Asn Arg Val
 405 410 415

Asn Ser Ser Asn Phe Cys Pro Thr Leu Ala Trp Asn Tyr Gly Ala Gln
 420 425 430

Met Val Ala Gln Asn Met Gln Gly Tyr Gly Lys Glu Leu Trp Gln Ala
 435 440 445

Phe Gly Lys Phe Lys Gly Asn Gly Gly Cys Gly Tyr Val Leu Lys Pro
 450 455 460

Gln Tyr Leu Leu Glu Asn Leu Pro Ser Gly Val Pro Phe Asn Pro Thr
 465 470 475 480

Ser Pro Arg Asn Thr Thr Leu Ile Leu Lys Ile Lys Val Met Thr Thr
 485 490 495

Leu Gly Trp Asp Lys Ala Phe Ser Lys Arg His Phe Asp Leu Phe Ser
 500 505 510

Pro Pro Asp Phe Phe Thr Arg Val Ile Val Val Gly Val Pro Ala Asp
 515 520 525

Glu Ala Lys Trp Lys Thr Ser Val Val Asp Asn Ser Trp Ala Pro His
 530 535 540

Trp Asn Glu Asp His Glu Phe Ala Leu Lys Cys Pro Glu Leu Ala Leu
 545 550 555 560

Leu Arg Ile Glu Val Arg Asp His Asp Asp Asp Ser Lys Asp Glu Phe
 565 570 575

Glu Gly Gln Thr Cys Leu Pro Ile His Glu Val Arg Asp Gly Tyr Arg
 580 585 590

Cys Met Gln Met Tyr Asp Lys Lys Gly Asn Val Leu Lys Gly Val Leu
 595 600 605

Met Leu Phe His Phe Gln Lys Cys Lys Cys Thr Phe Gln Asp Thr Ala
 610 615 620

Pro Ile Ser Ser
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<210> 13
 <211> 258
 <212> PRT

100230 243330

<213> Physcomitrella patens

<400> 13

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Met Ser Thr Glu Lys Glu Arg Glu Ser Tyr Val Tyr Met Ala Lys Leu
 1           5           10           15

Ala Glu Gln Ala Glu Arg Tyr Asp Glu Met Val Glu Ser Met Lys Lys
      20           25           30

Val Ala Lys Leu Asp Val Glu Leu Thr Val Glu Glu Arg Asn Leu Leu
      35           40           45

Ser Val Gly Tyr Lys Asn Val Ile Gly Ala Arg Arg Ala Ser Trp Arg
      50           55           60

Ile Met Ser Ser Ile Glu Gln Lys Glu Glu Ser Lys Gly Asn Glu Gln
      65           70           75           80

Asn Val Lys Arg Ile Lys Asp Tyr Arg His Lys Val Glu Glu Glu Leu
      85           90           95

Ser Lys Ile Cys Asn Asp Ile Leu Ser Ile Ile Asp Gly His Leu Ile
      100          105          110

Pro Ser Ser Ser Thr Gly Glu Ser Thr Val Phe Tyr Tyr Lys Met Lys
      115          120          125

Gly Asp Tyr Tyr Arg Tyr Leu Ala Glu Phe Lys Thr Gly Asn Glu Arg
      130          135          140

Lys Glu Ala Ala Asp Gln Ser Leu Lys Ala Tyr Gln Ala Ala Ser Ser
      145          150          155          160

Thr Ala Val Thr Asp Leu Ala Pro Thr His Pro Ile Arg Leu Gly Leu
      165          170          175

Ala Leu Asn Phe Ser Val Phe Tyr Tyr Glu Ile Leu Asn Ser Pro Glu
      180          185          190

Arg Ala Cys His Leu Ala Lys Gln Ala Phe Asp Glu Ala Ile Ala Glu
      195          200          205

Leu Asp Thr Leu Ser Glu Glu Ser Tyr Lys Asp Ser Thr Leu Ile Met
      210          215          220

Gln Leu Leu Arg Asp Asn Leu Thr Leu Trp Thr Ser Asp Leu Gln Asp
      225          230          235          240

Glu Gly Gly Asp Asp Gln Gly Lys Gly Asp Asp Met Arg Pro Glu Glu
      245          250          255

Ala Glu

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<210> 14

<211> 257

<212> PRT

<213> Physcomitrella patens

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[illegible]

<213> Physcomitrella patens

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Asn	Ala	Leu	Pro 20	Asp	Leu	Gln	Ser	Arg 25	Asn	Ser	Phe	Ser	Lys 30	Asn	Asp
Glu	Gly	Ser 35	Lys	Gly	Tyr	Leu	Thr 40	Pro	Ser	Glu	Met	Arg 45	Gln	Ala	Ala
Glu	Ala 50	Glu	Ala	Ala	Ala	Leu 55	Leu	Leu	Gly	Val	Gln 60	Leu	Ser	Ser	Lys
Ile 65	Phe	Glu	Asn	Ala	Ala 70	Ser	Lys	Leu	Pro	Thr 75	Glu	Asp	Ser	Ala	Glu 80
Ile	Thr	Glu	Asp	Val 85	Phe	Ser	Ser	Thr	Leu 90	Gln	Ser	Tyr	Leu	Thr 95	Ala
Ile	Ala	Asp	Ala 100	Leu	Glu	Asp	Glu	Pro 105	Val	Val	Val	Ser	Val	Leu	Asp
Gly	Ser	Ala 115	Ile	Lys	Ala	Leu 120	Leu	Glu	Asp	Glu	Asp 125	Asp	Phe	Ala	Met
Val 130	Ala	Glu	Asp	Leu	Phe	Glu 135	Lys	Leu	Asp	Thr	Asp 140	Glu	Ser	Gly	Lys
Leu 145	Ser	Ser	Lys	Glu	Leu 150	Arg	Pro	Ala	Ile	Met 155	Gln	Leu	Gly	Val	Glu 160
Gln	Gly	Val	Pro 165	Pro	Ala	Ala	Ala	Thr	Thr 170	Glu	Ala	Glu	Glu	Leu 175	Val
Thr	Lys	Leu	Ile 180	Asn	Lys	Tyr	Gly	Gln 185	Gly	Thr	Glu	Glu	Leu	Gly 190	Gln
Ala	Gln	Phe 195	Ala	Ala	Leu	Leu	Gln 200	Asp	Val	Leu	Gln	Asp 205	Met	Ala	Glu
Ser 210	Leu	Ala	Glu	Lys	Pro	Ile 215	Thr	Ile	Val	Arg	Asp 220	Val	Lys	Met	Leu
Asn 225	Gly	Ser	His	Leu	Arg 230	Lys	Met	Leu	Ala	Asp 235	Glu	Lys	Ala	Phe	Lys 240
Glu	Met	Ala	Asp	Asn 245	Met	Phe	Asn	Asp	Leu 250	Asp	Val	Asn	Lys	Asp 255	Gln
Arg	Leu	Ser	Lys 260	Ala	Glu	Ile	Arg	Pro 265	Leu	Phe	Glu	Gln	Gln	Thr 270	Ala
Ala	Trp	Gly 275	Leu	Pro	Pro	Val	Gly 280	Asp	Ser	Asp	Thr	Glu 285	Glu	Leu	Phe
Asp 290	Glu	Val	Phe	Lys	Ala	Val 295	Asp	Ser	Asp	Lys	Ser	Gly	Glu	Val	Glu 300

Lys Pro Glu Phe Ala Val Leu Val Lys Thr Leu Leu Ala Asp Phe Ala
 305 310 315 320

Glu Thr Leu Arg Leu Asn Pro Ile Leu Val Glu Ile Glu Thr Ala Ser
 325 330 335

Arg

<210> 16

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 16

caggaaacag ctatgacc

18

<210> 17

<211> 19

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 17

ctaaagggaa caaaagctg

19

<210> 18

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 18

tgtaaaacga cggccagt

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<210> 19

<211> 26

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 19

caggtccgag ctgacgatga acccag

26

00230-443360

<210> 20
 <211> 33
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Primer

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<210> 21
 <211> 33
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Primer

<400> 21
 gcgttaacca acacctcagc gttccacatg cat 33

<210> 22
 <211> 26
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Primer

<400> 22
 cgagctctc caccagattc ctgttc 26

<210> 23
 <211> 34
 <212> DNA
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<220>
 <223> Description of Artificial Sequence: Primer

<400> 23
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<210> 24
 <211> 33
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Primer

<400> 24
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<210> 25
 <211> 34
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Primer

<400> 25
 atccccgggcg gactgtcgtg gacgagtgtg ctag 34

<210> 26
 <211> 33
 <212> DNA
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 <223> Description of Artificial Sequence: Primer

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<210> 27
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 <212> DNA
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 <223> Description of Artificial Sequence: Primer

<400> 27
 accagcctca acttagtcgc ctggac 26

<210> 28
 <211> 34
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 <223> Description of Artificial Sequence: Primer

<400> 28
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<210> 29
 <211> 33
 <212> DNA
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 <223> Description of Artificial Sequence: Primer

<400> 29
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<210> 30
<211> 26
<212> DNA
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<220>
<223> Description of Artificial Sequence: Primer

<400> 30
ccctgctcaa cgcccagctg cataat 26

<210> 31
<211> 32
<212> DNA
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<400> 31
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<210> 32
<211> 33
<212> DNA
<213> Artificial Sequence

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<400> 32
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<210> 33
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer

<400> 33
gcgctgcaga tttcatttgg agaggacacg 30

<210> 34
<211> 35
<212> DNA
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 34

cgcgcccggc ctcagaagaa ctcgtcaaga aggcg

35

<210> 35

<211> 25

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 35

gctgacacgc caagcctcgc tagtc

25

<210> 36

<211> 27

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 36

ccagcttagc agcgacagta gcgacgt

27

<210> 37

<211> 25

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

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25

<210> 38

<211> 26

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 38

ggccatggag aacaggaatc tgggtgg

26

<210> 39

<211> 25

<212> DNA

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25